The AEMET-γSREPS convection-permitting LAM-EPS in Antarctica

acalladop@aemet.es
sgonzalezh@aemet.es
@aemet_antartida

Agencia Estatal de Meteorología

Sergi González[1], Alfons Callado[2], Mauri Martínez[2], Benito Elvira[1], and Pau Escribà[2]

[1]Antarctic Group, AEMET, Spain [2]Predictability Group, AEMET, Spain

1. Introduction and objectives

Most scientists in Antarctica work outdoors and they are exposed to the weather conditions. This entails demanding weather forecasts in order to ensure the safety and security of the expeditions.

To fulfill this requirement, AEMET has tested during the last Antarctic campaign its new developed high-resolution multi-NWP and multi-BCs EPS (AEMET-γSREPS), helping the forecasters on duty at the Spanish stations.

This system is expected to improve the confidence in forecast by giving an uncertainty to the short-term forecasts, an important issue in the area given the lack of surface observations across most of the Southern Hemisphere (Jung et al. 2015).

The objective of this poster is to present the AEMET-γSREPS for Antarctica and to show a preliminary validation.

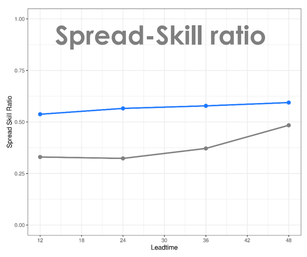
Multi-BCs / Multi-NWP	ECMWF / IFS	NCEP / GFS	MF / ARPÈGE	JMA / GSM	CMC / GEM
HARMONIE-AROME					
HARMONIE-ALARO					
WRF ARW					
NMMB					

γSREPS run at 00 UTC up to 48 hours with 12* members

* Original γSREPS design has 20 members. It is expected to have 16 members for next 2019-2020 campaign.

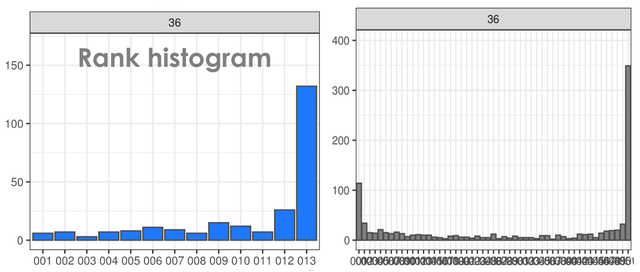
2. Objective validation

Temperature



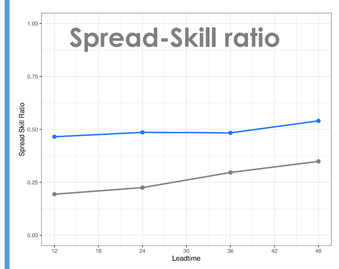
Basic variable, not very important for safety and security because summer temperatures are not too low at SSI*.

* South Shetland Islands

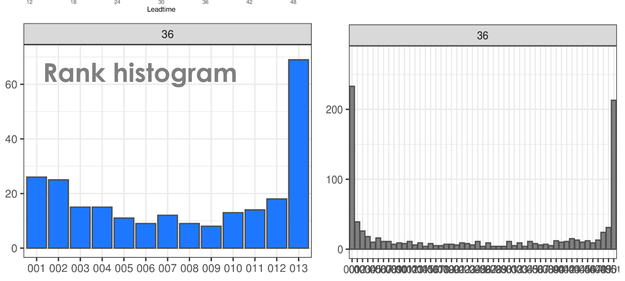


γSREPS temperature forecast performs better than the IFSENS (50 members' ECMWF EPS) on SSI* stations, but both "lose" some midday high temperatures.

Wind speed

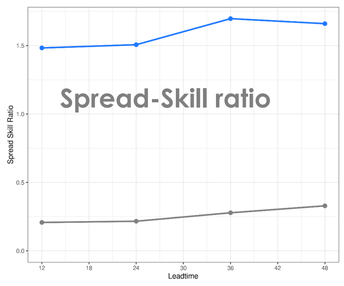


The most important variable. Most of the station operations depend on the wind speed.

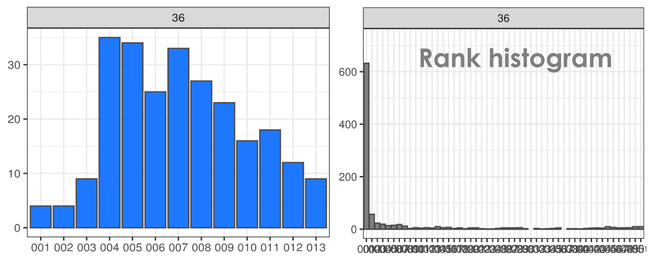


γSREPS forecast wind speeds with better SKILL-SPREAD ratio and less BIAS, however still "losing" some strong winds' events as IFSENS.

Visibility



A very important variable for scientist who work on the glacier.

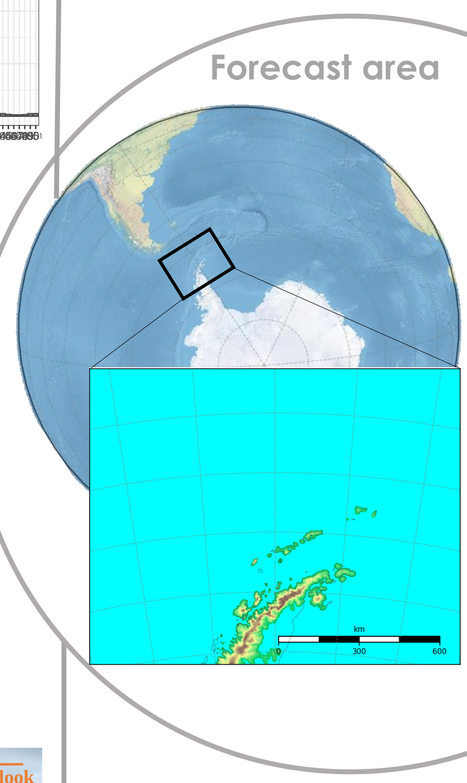


γSREPS provides a great improvement for visibility with respect IFSENS. γSREPS has excessive SPREAD and to slightly over-forecasts low visibility cases which are entirely missed by IFSENS.

IFSENS
gSREPS

Period: Jan – Mar 2019
Software: HARP v3

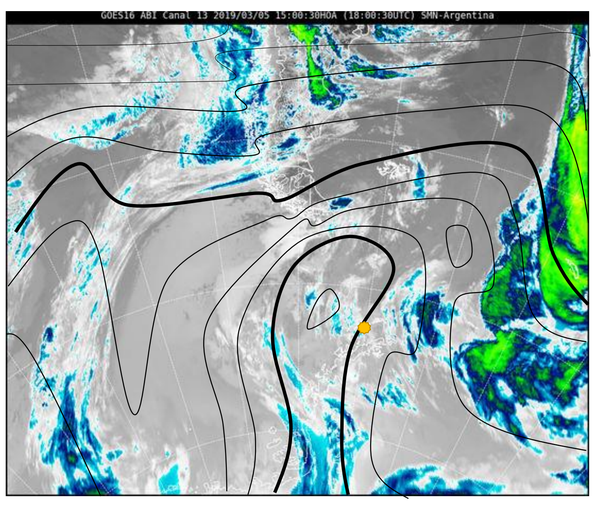
γSREPS improve forecast skill compared to IFSENS for those important variables for safety and security of the stations



The 2.5 km horizontal resolution of γSREPS with respect to 9/16 km of ECMWF allows it to better forecast small mesoscale structures formed by the mountainous island of Livingston like gaps of visibility, precipitation and winds.

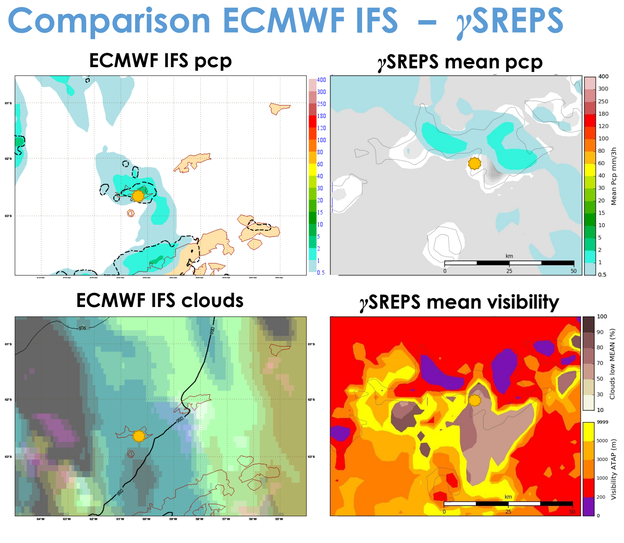
2. A case of study 5 March 2019

Synoptic setting



There is a low at NW of Livingston Island Pattern LDP** in Gonzalez et al. 2018
** Low over The Drake Passage

Comparison ECMWF IFS – γSREPS



ECMWF IFS forecast clouds and orographic precipitation around all the island. γSREPS forecasts successfully a gap of visibility and pcp in the south bay

Observations

At the Juan Carlos I station, it did not rain and the visibility was good enough for operations.

4. Conclusions

- AEMET-γSREPS improves IFSENS forecast skill for the most critical variables for safety and security at Maritime Antarctica
- The higher resolution of AEMET-γSREPS allow the forecasts to "see" mesoscale effects unnoticed by ECMWF
- During the campaign 2018-19 AEMET-γSREPS provided a very valuable source of information for the weather forecasters at Juan Carlos I station
- AEMET-γSREPS could be improved for "low-latitude" polar regions by including NWP "cold regions"-specific physical parametrizations'

References

Jung, T., and Coauthors, 2016: Advancing Polar Prediction Capabilities on Daily to Seasonal Time Scales. Bull. Amer. Meteor. Soc., 97, 1631-1647, https://doi.org/ 10.1175/BAMS-D-14-00246.1.

Gonzalez, S., Vasallo, F., Recio-Blitz, C., Guijarro, JA. and Riesco, J., 2018. Atmospheric Patterns over the Antarctic Peninsula. J. Climate, 31, 3597-3608, https://doi.org/10.1175/JCLI-D-17-0598.1.

Acknowledgments

This is a contribution to the Year of Polar Prediction (YOPP), a flagship activity of the Polar Prediction Project (PPP), initiated by the World Weather Research Programme (WWRP) of the World Meteorological Organization (WMO). Sergi Gonzalez's research activities are partly supported by ANTALP Research Group funded by Generalitat de Catalunya (2017 SGR 1102).

The authors acknowledge the help of Andrew Singleton (HARP), Roberto Ribas (BUFR), Ulf Andrae (VOBS from IFSENS), Alberto Martínez and the Antarctic Group of AEMET.

MAY THE $-2m\Omega \times v \; -m\nabla_p \Phi$ BE WITH YOU